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ABSTRACT

Vocational education is a major component of our educational systems at the secondary and postsecondary school level. The passage of the Vocational Education Act of 1963 broadened the definition of vocational education from training people for specific occupations to developing human potential and long-term employability. However, due to the impact of industry and labor on vocational education legislation, most vocational programs tend to be related to specific jobs and job titles. It is important to identify the components of a specific job and each component's importance as well as evaluate the relevance of current vocational programs. Job analysis serves this dual function. The crucial step in job analysis is task analysis (a list of tasks that constitute the steps to performing a job). Since 1973, the United States Department of Defense has used the Comprehensive Occupational Data Analysis Program (CODAP) computerized system to organize, analyze, and report occupational information. Many of the methods and procedures used in the CODAP have been adapted in the development of the Vocational and Technical Education Consortium of the States (VTECS). Job and task analysis, particularly the capabilities of computerized systems, have implications for vocational program planning and evaluation. For example, task analysis may serve as a basis for curriculum planning and criterion-referenced student performance measures. Also, the task analysis approach for vocational education evaluation provides outcome measures to examine program cost-benefits. (EM)

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JOB AND TASK ANALYSIS IN THE EVALUATION OF VOCATIONAL EDUCATION PROGRAMS

Theodore Abramson

Vocational education is a major component of our educational systems at the secondary and post-secondary school level. Most people view vocational education in a different perspective than the more traditional curriculum and, in fact, have different expectations for the graduates of vocational and occupational education programs than they do for the students who obtain a more general or academic diploma. Different expectations for program outcomes have obvious implications for instructional and program processes and program products. These differences in perspectives can be understood when one views the evolution of vocational education from an historical perspective.

Gallinelli (1979) presents an overview of the historical, sociological, philosophical, and economic bases that traces the development of our current view of vocational education and the expectations for these programs as embodied in our current legislative mandates. As might be expected, the general view is a rather narrow one in terms of the expected outcomes for vocational education graduates. An examination of the legislation up to 1963 indicates that monies were allocated for specific training of people to fit within certain narrowly-defined, limited occupational groups that were perceived as required for the national interest.

Obviously, shifts in perceived national interest lead to changes in

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priorities for vocational education funding. Usually, these shifts lead to increases in the number of programs, vocations, and areas of concern that were to be funded through the federal legislation. Datta (1979) points out that it was not until the passage of the Vocational Education Act of 1963, PL-88-210, that the perspectives for vocational education were broadened to include the development of human potential and long-term employability rather than the continuation of vocational education funding for the sole purpose of training people for specific, selected occupations.

In the last 75 years of vocational education funding and legislation, the two obvious groups that have had the major impact on the legislative process were industry and labor. While both industry and labor obviously have their own agendas, the one thing that they do have in common is that they view the function of vocational education from the perspective of the industrial model. Viewed in this context it is no wonder that questions related to the skills, knowledges, and attitudes obtained by the trainees and the costs, which tend to be higher than the costs of traditional programs, and benefits (or profits) of the programs, have been a major concern of vocational education legislation and evaluation. It is only within the last 15 years that there appears to have been a recognition of the need for vocational education to broaden its perspectives in terms of general human development. This change in emphasis can be seen in terms of the increased usage of the word "education" as opposed to the word "training," and even more recently, the shift from "vocational education" to that of "occupational education."

Notwithstanding the expanded view of occupational education, most vocational programs, certainly at the secondary level, tend to be related to specific jobs and job titles. In view of this current state of affairs,

it becomes crucial to investigate the relationship between the jobs for which the students are being prepared and the content (knowledges, skills, and attitudes) that they are expected to master while they are in school. Job analysis is the technique that serves a dual function in this regard. On the one hand, job analysis helps to identify the components of a specific job and the importance of each of these components, and at the same time, job analysis can be used to evaluate components of instructional programs by investigating the relationship of these components to the jobs that exist in the world of work. Perhaps the relationship between job analysis and vocational education and its evaluation can best be seen by examining Wright's (1974) list of items that constitutes an appropriate job analysis.

1. A general description of the work to be done.
2. The organizational setting and relationships in which the work is accomplished.
3. The specific tasks which are to be carried out by the worker.
4. The equipment, tools, and materials to be used.
5. The working conditions, including special hazards.
6. The qualifications required to learn or to perform these tasks stated in terms of knowledges, skills, abilities, and personal characteristics (including physical).
7. The expected manner of quality of performance.
8. The process and expected outcomes of the performance (Wright, 1974, p. 13).

Most teachers would probably classify the items on this list as falling under the category of behavioral objectives and/or criterion-referenced measures. They would be right. Within this list there are a series of

items that require closer analysis. However, it is important to note the key word in Item 3--the word "tasks." According to the Department of Labor's Handbook for Analyzing Jobs (1973, p. 3), "task" is defined as "...one or more elements and is one of the distinct activities that constitute logical and necessary steps in the performance of work by the worker. A task is created whenever human effort, physical or mental, is exerted to accomplish a specific purpose." It would appear that the crucial step in job analysis would be what has come to be known as task analysis.

Teryek (1979), in his review of job analysis methods and procedures, indicates that there are six major procedures for gathering data that describe a job. The procedures generally used may be classified as: 1) interviews with workers or supervisors; 2) observations of work while it is in progress; 3) questionnaires completed by workers and supervisors; 4) completion of logs or diaries kept by employees over a period of time; 5) any combination of the above; and 6) a literature review of extant reports. This list is equally valid for task analysis. He (Teryek, 1979) briefly sketches the different approaches to job analysis developed by and used in different government and private industry groups and points out that the crucial aspect of each job analysis ultimately depends on the task list that is used in describing the jobs to be performed.

Berger and Hawkins (1979), in describing the automated approach to occupational analysis that is currently in use by the United States Department of Defense (DOD), traced the history of the U.S. Army's approach to job and task analysis over the last 50 years. Not surprisingly, their data gathering methods were basically those described by Teryek (1979). Since 1973, DOD has used the Comprehensive Occupational Data Analysis Program (CODAP) system that was originally developed by the United States Air Force

Human Resources Laboratory. The system consists of a set of more than 30 computer programs that organize, analyze, and report occupational information.

The steps in the system begin with the development of a task list questionnaire that is submitted to incumbents in the particular job for which the included tasks are supposedly descriptive. The incumbents complete the questionnaire on the basis of a relative time spent scale; that is, the incumbents who are involved in the specific tasks listed, indicate on a 1-7 scale the relative amount of time spent in doing the specific task, from (1) a very little, to (7) very much. Figure 1 shows a section from a task listing and the relative time scale for that particular section. These questionnaire data are analyzed in terms of the percent of members performing and the percent of time spent on the tasks. Campbell and Lindsey (1979), in describing Air Force performance ratings in relationship to their training programs, provide the following extract from an occupational survey report (see Figure 2, page 7).

Carpenter, Georgia, and McFarland (1975) found that the relative time-spent scales produced more reliable information than frequency of performance or exact percent time scales as reported by Air Force personnel. The CODAP system provides a systematic approach to reporting and summarizing what people actually do on the job. It is also possible to request from the system special job descriptions as a function of the incumbent's backgrounds, the available equipment, reported job satisfaction, and/or differences in work performed by different groups of people. For example, work performed by men versus women, work performed by people at different pay levels, work as a function of background skill or education, etc. This

TASK SECTION

IF YOU DON'T DO IT -- DON'T MARK IT!

		VERY LITTLE	BELOW AVERAGE	SLIGHTLY BELOW AVERAGE	AVERAGE	SLIGHTLY ABOVE AVERAGE	ABOVE AVERAGE	VERY MUCH
		Time Spent on Your Job						
B. PERFORM LENS SURFACING CALCULATIONS/INSPECTION DUTIES (CONT)	B							
21. RECORD AMOUNT AND BASE DIRECTION OF PRESCRIBED PRISM	21	☐	☐	☐	☐	☐	☐	☐
22. RECORD IDENTIFICATION DATA	22	☐	☐	☐	☐	☐	☐	☐
23. RECORD SPECIAL PROCEDURES	23	☐	☐	☐	☐	☐	☐	☐
24. VERIFY SEGMENT INSET	24	☐	☐	☐	☐	☐	☐	☐
25. RECORD SEGMENT INSET	25	☐	☐	☐	☐	☐	☐	☐
26. INSPECT LENSES FOR SURFACE DEFECTS USING INSPECTION LAMP	26	☐	☐	☐	☐	☐	☐	☐
27. PLACE SPHERE LAPS IN APPROPRIATE STORAGE RACK	27	☐	☐	☐	☐	☐	☐	☐
28. PLACE CYLINDER LAPS IN APPROPRIATE STORAGE RACKS	28	☐	☐	☐	☐	☐	☐	☐
29. INSP SURFACED LENSES FOR POWER ACCURACY USING LENSOMETER	29	☐	☐	☐	☐	☐	☐	☐
30. PREPARE SURFACE WORKSHEET FOR PLASTIC LENS BLANKS	30	☐	☐	☐	☐	☐	☐	☐
C. PERFORM LENS SURFACING DUTIES	C							
1. LAYOUT SEMI-FINISHED LENS BLANKS FOR SURFACING	1	☐	☐	☐	☐	☐	☐	☐
2. APPLY LENS COATING FOR BLOCKING	2	☐	☐	☐	☐	☐	☐	☐
3. BLOCK GLASS/PLASTIC LENS BLANKS USING ALLOY BLOCKING UNIT	3	☐	☐	☐	☐	☐	☐	☐
4. RECLAIM ALLOY FROM BLOCKING BODIES USING RECLAIM TANK	4	☐	☐	☐	☐	☐	☐	☐
5. CLEAN BLOCKING BODIES	5	☐	☐	☐	☐	☐	☐	☐
6. REDUCE DIAMETER USING CHIPPING PLIERS	6	☐	☐	☐	☐	☐	☐	☐
7. REDUCE DIAMETER USING LENS CRIBBER	7	☐	☐	☐	☐	☐	☐	☐
8. SELECT APPROPRIATE SPHERE LAP	8	☐	☐	☐	☐	☐	☐	☐
9. SELECT APPROPRIATE CYLINDER LAP	9	☐	☐	☐	☐	☐	☐	☐
10. CLEAN SPHERE LAPS	10	☐	☐	☐	☐	☐	☐	☐
11. CLEAN CYLINDER LAPS	11	☐	☐	☐	☐	☐	☐	☐
12. CHECK SPHERE LAPS FOR ACCURACY USING GAUGE SET	12	☐	☐	☐	☐	☐	☐	☐
13. CHECK CYLINDER LAPS FOR ACCURACY USING GAUGE SET	13	☐	☐	☐	☐	☐	☐	☐
14. TRUE SPHERE LAPS USING TRUING DISC AND HAND PAN	14	☐	☐	☐	☐	☐	☐	☐

Figure 1. Task section page from 1972 U.S. Army occupational survey questionnaire, (Berger and Hawkins, 1979).

Description of current job in aircraft maintenance career ladder based on background variables. Shows percent members performing and percent time spent on tasks. Tasks are sorted high to low percent time spent by group members.

Task job description, Cases=9233, Tasks=362, Duties=14, MBRS=9232
All airmen in Crr Field DAFSC 431X1X/91 TOTAL SAMPLE

D-Tsk	Duty/Task Title	Cumulative sum of average percent time spent by all members	Average percent time spent by all members	Average percent time spent by members performing	Percent of members performing
F 16	Inspect Aircraft for Structural Damage	72.89	1.60	1.17	1.17
F 17	Inspect Airframe and Components	70.82	1.60	1.13	2.30
M 2	Defuel or Refuel Aircraft	68.08	1.64	1.12	3.41
G 9	Launch and Recover Aircraft	62.31	1.66	1.03	7.69
1 8	Inspect and Service Liquid Oxygen Systems	42.67	1.25	0.53	42.78

Task job description, Cases=9233, Tasks=362, Duties=14, MBRS=174
DAFSC 43131A App Reciprocating Engine Aircraft

1 8	Inspect and Service Liquid Oxygen Systems	6.32	2.24	0.14	91.91

Task job description, Cases=9233, Tasks=362, Duties=14, MBRS=174
DAFSC 43131E App Reciprocating Engine Aircraft

1 8	Inspect and Service Liquid Oxygen Systems	37.58	1.87	0.70	55.98

Task job description, Cases=9233, Tasks=362, Duties=14, MBRS=1607
DAFSC 43151E Jet Aircraft Over Two Engines Specialist

1 8	Inspect and Service Liquid Oxygen Systems	47.92	1.22	0.59	47.44

Task job description, Cases =9233, Tasks=362, Duties=14, MBRS=672
DAFSC 43171E Jet Aircraft Over Two Engines Technician

1 8	Inspect and Service Liquid Oxygen Systems	54.17	0.85	0.46	51.79

3-, 5-, and 7-skill levels

Figure 2. Extracts from Occupational Survey Report, (Campbell and Lindsey, 1979).

type of approach obviously has a good deal to offer to non-military institutions involved in vocational education at both the secondary and post-secondary school levels. The civilian sector has, in fact, adapted many of the methods and procedures used by the DOD for development of the Vocational and Technical Educational Consortium of the States (VTECS) procedures and materials.

A good deal of flexibility has been built into the CODAP system. For example, the group difference program, which permits one to investigate differences in task performance between any two previously defined groups according to any set of characteristics that are deemed to be worthy of investigation. The program can be modified so that only tasks which exceed a given critical value in terms of time spent or in terms of percent performing will be printed. It is also possible to use background data in the system as categorical variables for multiple linear regression type studies. Part of a CODAP report is shown in Figure 3 (see page 9).

The first page of the printout shown in Figure 3 shows the breakdown of the job into its 18 component duties. The rest of the computerized report shows the tasks included under the job categorized according to the duties and listed in descending order of percent of members performing. In the DOD scheme of things, duties are an intermediate category between job (macro-description) and task (micro-description).

This brief description of job and task analysis, particularly the computer capabilities of CODAP and similar systems such as VTECS that are in the process of being developed, have rather direct implications for planning and evaluation. For example, task analysis may serve as a basis for curriculum planning and can lead to statements of behavioral objectives and criterion-referenced measures that assess student learning of

MOS 63B AUTHORIZED GRADE 1-4 (EPMS SL 11) PG 1-4 PAGE 1

DUTY	JOB DESCRIPTION	CASES	TASKS	DUTIES	HOURS
		900	633	18	674

D-TSK	DUTY/TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
G	PERFORM POWER TRAIN COMPONENT MAINTENANCE	99.25	11.09	10.96	10.95
F	PERFORM GASOLINE/DIESEL ENGINE ELECTRICAL SYSTEM MAINTENANCE	99.08	21.77	20.98	30.93
D	PERFORM GASOLINE AND DIESEL FUEL SYSTEM MAINTENANCE	93.73	11.64	10.83	41.77
C	PERFORM GASOLINE AND DIESEL ENGINE MAINTENANCE	93.56	7.13	6.67	48.43
E	PERFORM GASOLINE/DIESEL ENGINE COOLING SYSTEM MAINTENANCE	93.03	6.90	6.49	53.92
B	PERFORM BRAKE MAINTENANCE	92.86	10.79	10.02	63.94
J	PERFORM BODY/CAB/FRAME/TOWING ATTACHMENT MAINTENANCE	87.11	4.54	3.97	67.92
N	PERFORM MILITARY DUTIES	83.95	4.73	3.95	71.87
M	PERFORM MAINTENANCE ADMINISTRATION	79.79	8.09	6.45	78.32
P	PERFORM WHEELED VEHICLE OPERATOR DUTIES	78.40	7.48	5.87	84.19
I	PERFORM STEERING SYSTEM MAINTENANCE	76.48	3.70	2.83	87.01
K	PERFORM SPRING AND SHOCK ABSORBER MAINTENANCE	74.39	2.73	2.03	89.05
A	PERFORM WHEELED VEHICLE MECHANIC SUPERVISION	56.79	7.79	4.39	93.44
O	PERFORM TIRE REPAIR DUTIES	55.92	2.67	1.49	94.93
L	MAINTAIN WHEELED VEHICLE WINCH, POWER TAKEOFF AND HOIST	54.70	2.18	1.19	96.13
Q	PERFORM SHOP MANAGEMENT DUTIES	42.68	3.70	1.58	97.71
H	PERFORM WRECKER OPERATOR/RECOVERY OPERATION DUTIES	38.86	1.61	1.79	99.50
R	PERFORM GENERATOR SET OPERATOR DUTIES	14.29	2.88	.41	99.91

Figure 3. Results of Military Occupational Survey 63B Wheel Vehicle Mechanic, (Abramson, 1978)

MOS 63Q0 AUTHORIZED GRADE 1-9 (EPMS SL 11

TASK	JOB DESCRIPTION	CASES	TASKS	DUTIES	HRS
		900	633	18	574

D-TSK	DUTY/TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING	TASK SEQ NO
G 10	ADJUST CLUTCH LINKAGE	89.99	.86	.73	.73	
H 16	BLEED BRAKE SYSTEM	89.15	.82	.69	1.42	
E 23	ADJUST FAN BELTS	83.45	.81	.68	2.10	
H 8	ADJUST HAND PARKING BRAKE	82.68	.85	.71	2.81	
E 19	REPLACE RADIATOR HOSES	82.40	.66	.54	3.35	6
E 22	REPLACE FAN BELTS	81.88	.72	.59	3.94	
F 60	TEST BATTERIES	81.63	.79	.64	4.58	
G 48	SERVICE WHEEL BEARING	80.84	.89	.72	5.30	
F 51	REPLACE HEAD AND TAIL LIGHTS	80.49	.68	.55	5.85	
F 42	REPLACE SPARK PLUGS	80.14	.64	.51	6.36	10
F 50	TEST HEAD AND TAIL LIGHTS	79.79	.81	.66	7.01	
G 50	REPLACE WHEEL BEARING	79.62	.78	.62	7.63	
F 61	REPLACE BATTERIES	79.44	.81	.64	8.27	
C 23	REPLACE ENGINE OIL FILTER ELEMENT	77.87	.86	.67	8.94	
G 51	REPLACE WHEEL SEALS	77.35	.78	.61	9.54	15
F 18	ADJUST ALTERNATOR BELT	76.61	.69	.49	10.03	
F 40	SERVICE SPARK PLUGS	75.24	.62	.46	10.49	
F 62	REPLACE BATTERY CABLES	74.91	.66	.49	10.99	
G 44	ADJUST SERVICE BRAKE SHOES	74.74	.69	.52	11.50	
H 7	INSPECT BRAKE SYSTEMS	74.74	.75	.56	12.07	20
F 14	REPLACE ALTERNATOR	74.56	.60	.46	12.61	
F 17	REPLACE GENERATOR	74.56	.69	.44	12.96	
C 1	TROUBLESHOOT 1/4 TON SERIES GASOLINE ENGINE MALFUNCTIONS	74.39	.73	.54	13.50	
G 49	ADJUST WHEEL BEARING	74.39	.83	.62	14.11	
H 11	ADJUST HAND BRAKE SHOE	74.39	.71	.53	14.64	25
E 13	REPLACE RADIATOR	74.22	.58	.43	15.07	
H 9	REPLACE HAND PARKING BRAKE	73.69	.69	.51	15.58	
F 41	ADJUST SPARK PLUGS	73.52	.62	.46	16.03	
F 39	ADJUST POINT SET	73.34	.58	.42	16.46	
H 13	REPLACE MASTER CYLINDER	73.00	.61	.45	16.91	30
H 15	REPLACE WHEEL CYLINDER	72.65	.63	.46	17.36	
E 12	INSPECT ENGINE COOLING SYSTEMS	72.30	.69	.50	17.86	
F 19	REPLACE ALTERNATOR BELT	72.30	.58	.42	18.28	
H 12	REPLACE HAND BRAKE SHOE	72.13	.67	.49	18.77	
F 30	REPLACE INSTRUMENT GAUGES	71.96	.66	.47	19.24	35
H 3	TROUBLESHOOT 2 1/2 TON SERIES BRAKES FOR MALFUNCTIONS	71.95	.62	.45	19.69	

Figure 3. (Continued)

the appropriate knowledges, skills, and attitudes (Campbell and Lindsey, 1979; Whitmore, 1979). Additionally, a CODAP-type system can help occupational educators derive listings of tasks that are required of employees at different levels. The listing can be tailored to include only those tasks which generally require a certain percent of worktime, say 30% or more, that employees spend at their job. It is also possible to use task lists to help develop job families that incorporate skills, knowledges, and attitudes that are normally embodied in different courses.

From the perspective of evaluating an ongoing program, task lists from existing data banks or developed as needed can serve as a major criterion for evaluating the relevance of the current programs. The skills and knowledges mastered by the students in the program can be matched to the current expectations of the job market as indicated by the actual skills required of the people in the field. It is also possible to develop questionnaires for program graduates based on the task lists developed by CODAP-type systems to see whether or not the program graduates, at the time of their graduation, rate themselves as being capable on the tasks incorporated in the task lists. Follow-up studies are another area in which these type of data would play a crucial role.

Task and job analysis descriptions could also serve as a basis for formative evaluation systems that might employ any one of a number of approaches. For example, a school system could easily employ a discrepancy evaluation model (Steinmetz, 1976) that has a set of goals drawn from existing job and task analyses. That is, school personnel could develop a set of priorities drawn from lists provided by a CODAP system. The tasks included in the training component of the program provided by the institution would be a function of the institution's past history, it's capabilities,

experiences, the job market for which it is preparing its students, the success it has had in placing its students, and continuing success in the job market of the program's graduates. The instructional systems development (ISD) approach based on task analysis that is used by the DOD is described by Campbell and Lindsey (1979) and Berger and Hawkins (1979).

Task Analysis and Cost Estimates

An important consequence of the task analysis approach for vocational education evaluation is that it provides outcome measures against which one can measure a planned or an ongoing program and also makes it possible to examine the outcome of the program from the perspective of cost benefit analysis. That is, a CODAP-type system contains data useful in evaluating program outcomes and estimates of the costs and benefits of these outcomes. The brief discussion below is merely meant to be suggestive and hopefully will help to stimulate further developments and applications in this area.

Two concepts proposed for consideration that have been useful in arriving at estimates in cost effectiveness studies are the staging concept taken from medical care and the seriousness index (or what might be termed importance level) described in a recent study of residential community corrections (Gray, Conover, and Hennesey, 1978).

Gonnella, Louis, and McCord (1976) defined staging in terms of medical care as a means of describing different levels of severity for specific medical problems. Typically, Stage 1 describes a disease with minimal severity. Stage 2 is descriptive of a disease with moderate severity, and Stage 3 represents disease with serious complications. It is of course possible to describe more than three stages, or sub-stages within each of the three main categories. Of course, description and determination of a

specific stage does not indicate causes of the problem. Nor is there necessarily universal agreement and acceptance of the criteria. Conceivably, a different group of "experts" (medical societies, certification boards, etc.) might develop a different set of criteria. The staging concept, however, is clear. A recent study was reported of the cost of rheumatoid arthritis that used four stages to develop estimates of indirect and direct costs for Stage 3 severity arthritis patients (Meenan, Yelin, Heuke, Curtis, and Epstein, 1978). Using a CODAP-type system, one can develop stages for the skills, knowledge and attitudes required of graduates that would be analogous to the staging concept. That is, one can list those items that are required of 75% of the personnel who are in the job market, those skills required by only 50%, and those skills required by only 25% of the personnel employed in the particular job. Institutions in the process of training people for these jobs would then be able to develop cost estimates for the training of the people in the three stages. The cost decisions would, in effect, be based on comparisons of different training programs that would yield the different levels of skills and knowledges of the trainees depending on whether they were in Stage 1, 2, or 3 programs. The usual problems of cost estimates would still have to be solved: short term vs. long term, expenditures vs. costs, allocation of joint costs, treatment of current and capital costs, etc. A major concern for the educational institution would be to develop a training program within its funding level that maximizes its students' outcomes without bankrupting itself. Staging and substaging based on task analysis would yield cost estimates useful in a rational decision process applied to these issues.

Another option might be to scale the tasks included in the task analysis according to some importance weighting scheme, similar to the severity

index developed for the residential community corrections study. In this system, experts would be asked to rate the different tasks within a given percent-of-members-performing scale, or a percent-of-time-spend-performing scale. Values could then be scaled and estimates of the costs and benefits for each of the specific tasks could then be included in the cost benefit analysis. For example, all those tasks at the 50% members performing level could be scaled in terms of perceived importance, and cost allocations could be scaled accordingly. For example, Berger and Hawkins (1979) describe the use of the CODAP system in relation to its cost effectiveness as a result of varying the scale values that relate to decisions about the training to be included and the purposes for which it should be accomplished.

Both of these approaches have obvious ramifications for state or district allocation of funds for occupational education programs and the expected levels of sophistication in each of these programs. These approaches would not replace the current political and value judgments that are inherent in the ongoing programs in the school systems within any region or state. Rather, it would make more explicit what those value systems are, and ultimately permit a closer look at the costs and benefits of those value systems.

Notwithstanding the need for cost benefit analysis and the possibilities of fuller descriptions of what should be included in vocational education programs based on scales of actual performance and time spent, Hu and Stromsdorfer (1979) concluded their review of cost benefit analysis in vocational education as follows:

> Future studies of vocational education should be focused not only on the economic data but also on the non-economic benefits and cost of vocational education, in this respect, economists, educators and psychologists should work together to improve the techniques of benefit cost analysis and vocational education.